195
LIBRARY
FISH & WILDLIFE SERVICE
PACIFIC OCEANIC FISHERY
INVESTIGATIONS
411.055

PROCEEDINGS OF THE UNITED STATES NATIONAL MUSEUM

issued by the

SMITHSONIAN INSTITUTION
U. S. NATIONAL MUSEUM

Vol. 96 Washington : 1945 No. 3195

HYPORHAMPHUS PATRIS, A NEW SPECIES OF HEMIRAMPHID FISH FROM SINALOA, MEXICO, WITH AN ANALYSIS OF THE GENERIC CHARACTERS OF HYPORHAMPHUS AND HEMIRAMPHUS

By Robert R. Miller

The paucity of our knowledge of the fresh-water fish fauna of northwestern Mexico is evident from the novelties which Ralph G. Miller has collected in that region in recent years. In addition to the distinctive *Dorosoma smithi* Hubbs and Miller (1941) and a new *Gila* being described by me in Copeia, a new species of halfbeak of the genus *Hyporhamphus* is now made known.

About 60 years ago Meek and Goss (1885, p. 221) wrote that the American halfbeaks referred to *Hemiramphus*[1] were "in a condition of great confusion." Although a number of papers dealing with the New World species have appeared since that time, the systematic status and particularly the distribution of the American forms are still far from clear.

The discovery of the new halfbeak, described below, brings up the question of the generic validity of *Hyporhamphus* and has prompted a critical study of *brasiliensis* and *unifasciatus*, the genotypes, respectively, of *Hemiramphus* Cuvier and *Hyporhamphus* Gill. This study has proved to be most productive, for a number of trenchant and easily observed characters, heretofore apparently overlooked, were found. The presence or absence of scales on the upper jaw also was noted by Smith (1933, p. 130). In preparing table 1, in which the genotypes of *Hemiramphus* and *Hyporhamphus* are compared, I examined 135 specimens of *unifasciatus* and 65 specimens of *brasiliensis* in the collections of the U. S. National Museum. These specimens represent

[1] Spelled *Hemirhamphus* by them and by a host of other authors. The original spelling by Cuvier (1817, p. 186) is *Hemi-Ramphus*.

material from the known American range of both species: *unifasciatus*, from Cape Cod to Uruguay in the Atlantic and from San Diego [2] to Peru in the Pacific; and *brasiliensis*, from New York to Brazil.

Gill (1859, p. 131) based *Hyporhamphus* principally on the tricuspid teeth (whence the name of the type species, *H. tricuspidatus*, a synonym of *unifasciatus*), but he later (1863) found, and Poey (1860, p. 298) previously had noted, that *Hemiramphus* likewise has tricuspid teeth. Poey's and Gill's observations on the nature of the teeth were correct, and hence I do not agree with Weed (1933, pp. 47, 57) and others who stated that the teeth are simple in *Hemiramphus*. As Smith (1933) has shown, and as I have also observed, the form and arrangement of the teeth vary with age and with different species. The jaws of a single individual may have unicuspid, bicuspid, and tricuspid teeth, and, in at least one American species, *Hyporhamphus rosae* (Jordan and Gilbert), only the largest individuals appear to have tricuspid teeth—hence the frequent statement that *H. rosae* has only unicuspid teeth.

The fundamental characters distinguishing the American species of *Hemiramphus* and *Hyporhamphus*, such as the presence or absence of scales on the upper jaw, the presence or absence of a bony rim along the side of the nasal fossa, and the arrangement of the sensory canal and pores on the preorbital (fig. 9), may be features that will separate world halfbeaks of this type. This is suggested to me by Smith (1933, pp. 130–131), who made a primary division in his key on the basis of a naked versus a scaled upper jaw, and by the very few Old World halfbeaks I have examined. In *Euleptorhamphus* Gill, however, the upper jaw is scaled as in *Hyporhamphus*, whereas the rim and the form of the nasal fossa and the sensory canal of the preorbital are essentially as in *Hemiramphus*.

The pattern of the scales on the upper jaw, the shape of the preorbital, and the arrangement of the teeth may be found to have generic or only specific value. The solution of these problems will necessitate a comprehensive review of the halfbeaks of the world.

The form of the sensory canal and the pore on the preorbital are usually visible in *Hyporhamphus*, but the overlying scales and skin must be dissected from this bone in *Hemiramphus* before the canal and pores can be clearly seen. The two pores shown near the upper end of the posterior margin of the preopercle in *Hyporhamphus* (fig. 9, A) are apparently absent in *Hemiramphus*, but this character was checked only on a comparatively few individuals of each genus.

In table 1 I have abandoned the "key" characters—air bladder cellular or simple, sides of body vertical or convex, position and shape of

[2] In material from San Diego, Calif. (Stanford Nat. Hist. Mus. No. 9912) I found one specimen of this species, which, to my knowledge, represents a northward extension of known range on the Pacific coast.

dorsal fin, and position of pelvics—used by many writers to separate *Hemiramphus* from *Hyporhamphus*. The nature of the air bladder is difficult to discern but may be of considerable phylogenetic importance; the form of the sides of the body is an untrustworthy character because it is frequently rendered impractical by preservation; the position and shape of the dorsal fin is not so distinctive a feature as is the difference in the basal lengths of the dorsal and anal fins; and the position of the pelvic fins is useful largely for specific or subspecific separations.

TABLE 1.—*Diagnostic differences between* Hyporhamphus unifasciatus *and* Hemiramphus brasiliensis [1]

Character	*unifasciatus*	*brasiliensis*
Upper jaw	Scaled	Naked.
Margin of nasal fossa (see fig. 9).	Surmounted by a prominent bony rim along posterolateral border.	Lacking a bony rim in this position.
Sensory canal on preorbital (see fig. 9).	Unbranched; with an exposed pore on side and another pore at terminus of canal near anterior margin of nasal fossa.	Branched; with a pore at end of posterior branch (which terminates in a bony ridge near front of orbit) and a pore at end of anterior branch near anteroventral margin of nasal fossa.
Dorsal fin	Over or nearly over origin of anal, its base and that of anal equal or subequal.	In advance of anal origin, its base 1.5 to 2.1 times that of anal fin (1.3 or 1.4 in young).
Caudal fin	Moderately forked, the distance between caudal base and shortest caudal rays 7.4 to 9.0 in standard length.	Deeply forked, the distance between caudal base and shortest caudal rays 12.5 to 16.3 in standard length.
Shape of nasal fossa in adult.	Broad, and little depressed, its greatest inner diameter more than one-half that of orbit.	Narrow and greatly depressed, its greatest diameter one-fourth to one-third that of orbit.

[1] Characters of *Hyporhamphus* confirmed on the type specimen (U.S.N.M. No. 3407) of the genus, *H tricuspidatus*(=*unifasciatus*), and of *Hemiramphus* on "topotypes" (specimens from Jamaica, U.S.N.M. No. 30077) of *H. brasiliensis*.

The new species described below is the first to be definitely recorded from fresh water in the New World. It appears to be restricted to a fluviatile habitat, for a number of collections of halfbeaks along the west coast of Mexico in the region where the new species was discovered contain no species identical with it.

I name this distinctive fish *patris*, genitive of *pater* (father), because my father, Ralph G. Miller, collected the 14 types and only known specimens.

HYPORHAMPHUS PATRIS, new species

PLATE 11

Types.—The holotype (U.S.N.M. No. 129956) is a mature adult (presumably a female, see below), 118 mm. in standard length, and was collected on May 4, 1942, by Ralph G. Miller in Río del Fuerte, one-half mile above the town of El Fuerte, which is about 20 miles northeast of San Blas, Sinola, Mexico. The 13 paratypes (U.S.N.M.

No. 129957), 107 to 130 mm. long, were collected with the holotype. One fish in the lot, a specimen 113 mm. in standard length, is the only individual of the series that has distinctly larger pectoral and pelvic fins. On examination it was found to be a ripe male. One of the others, a specimen 109 mm. long with short pectorals and pelvics, was found to contain eggs in various stages of development, some of them apparently fully mature. The remainder are presumably all females.

Diagnosis.—A *Hyporhamphus* with pelvic fins about equidistant between caudal base and gill opening, 21 to 24 gill rakers on lower limb of first arch, with a relatively long mandible (3.6 to 4.2 in standard length), without scales on dorsal or anal fins, and without the fleshy tip of the mandible red.

Description.—Body rather slender, its depth 8.0 to 9.6 in standard length, little compressed, the sides rounded; width of body in depth 1.05 to 1.4; head 4.5 to 5.0 in standard length; mandible (measured from tip of upper jaw to end of bony tip) 3.6 to 4.2 in standard length and 0.7 to 0.9 in head length (broken in one specimen); snout 2.8 to 2.9 in head; orbit 4.0 to 4.3 in head, 1.35 to 1.45 in snout, and 1.65 to 1.85 in postorbital; interorbital 3.8 to 4.1 in head and 1.55 to 1.7 in postorbital; length of preorbital 1.5 to 1.65 in orbit; depth of preorbital 1.5 to 1.75 in orbit; width of nasal fossa 1.85 to 2.15 in orbit; base of anal fin 1.01 to 1.08 in base of dorsal fin; pectoral short, 8.4 to 9.35 in standard length in females (7.9 in the male) and 1.75 to 1.95 in head (1.65 in male); pelvic 2.7 to 3.0 in head in females (2.25 in male); midcaudal rays (measured from midbase of caudal fin to tip of shortest middle ray or rays) 8.4 to 9.3 in standard length, 1.7 to 1.9 in head, and 2.1 to 2.4 times the length of the orbit.

The fin rays vary in number as follows: Dorsal 13 to 15, usually 14; anal 15 or 16, usually 16; pectorals 10–10, 10–11, or 11–11, almost always 10–10; pelvics always 6–6. I depart from my usual method in counting the rays of the dorsal and anal fins and regard every element as a separate ray, because this procedure has been followed by virtually all students of this group of fishes. Without exception the first two rays of the dorsal fin are unbranched, and the first two rays of the anal fin are also simple except in two specimens in which the first three rays are unbranched.

The gill rakers on the lower limb of the first gill arch (counted on both sides) vary from 21 to 24.

The lateral series scales (counted from upper angle of gill opening to caudal base) number about 53 to 59, usually 55 to 57; an accurate count is difficult to obtain because the scales are largely missing from the sides.

The pelvic fins lie about equidistant between the base of the caudal fin and the gill opening, varying between the pectoral base and the middle of the opercle. The dorsal fin varies in position from equi-

distant between caudal base and pelvic insertions to much nearer pelvic insertions than caudal base.

The teeth of the holotype are unicuspid, bicuspid, and tricuspid and are arranged in about three to seven irregular rows in the upper jaw and two to five rows in the lower jaw. Tricuspid teeth are present only posteriorly in each jaw and virtually all the anterior teeth (from about the middle of each jaw forward) are unicuspid. In the region where unicuspid and tricuspid teeth intergrade, occasional bicuspid teeth occur. The tooth rows are conspicuously broader medially on each side of the upper jaw than they are at either end, and teeth are

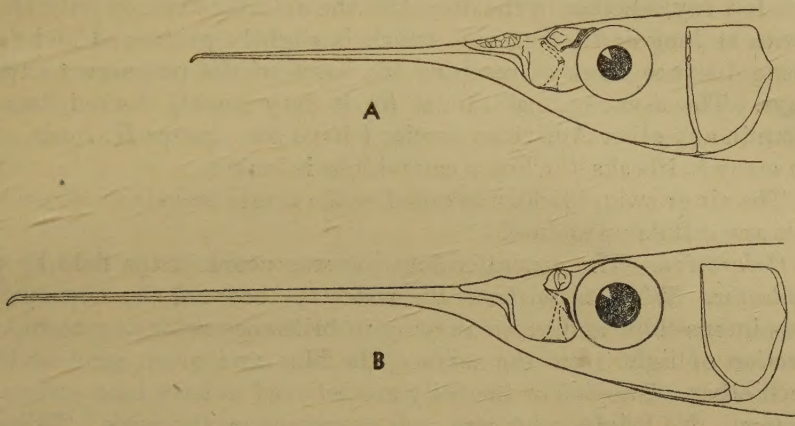


FIGURE 9.—Sketch of head regions of *Hyporhamphus* and *Hemiramphus* to illustrate certain diagnostic differences (see table 1): A, *Hyporhamphus unifasciatus*, 183 mm. in standard length, from Key West, Florida (U.S.N.M. No. 34999); B, *Hemiramphus brasiliensis*, 182 mm. long, from Key West, Florida (U.S.N.M. No. 38684). Drawn by Mrs. A. M. Awl, U. S. National Museum.

absent at the tips of both upper and lower jaws. In the lower jaw the rows of teeth are of nearly uniform width but are somewhat broader close to the proximal end on each side and then become narrow gradually forward and abruptly behind this region. In the largest paratype (130 mm. in standard length) there are more tricuspid teeth than in the holotype (118 mm. long), which agrees with my observation in *H. rosae* that tricuspid teeth appear with increasing size of the individual (this was also noted in other American *Hemiramphus* and *Hyporhamphus*). Otherwise the teeth of the paratypes have essentially the same form and arrangement as in the holotype.

The triangular upper jaw is rather bluntly pointed at the apex and broader at the base than it is long. When the mouth is closed most of the outer teeth of the lower jaw are exposed. The scales of the upper jaw are irregularly arranged, the transverse rows numbering five or six across the base, then about four, whereas from about the middle to the tip of the jaw they are biserial—with a single scale on each side of

the slight median ridge. Although the scales cross this low ridge posteriorly they do not usually do so anteriorly.

No scales were observed at the tip of the upper jaw, but these may have dropped off. The sides of the head, including the region of the mandible below the jaws, are covered with deciduous scales.

The margins of the prolonged mandible or "beak" are nearly parallel throughout, diverging little until the posterior end is reached. The nasal flap is small.

The dorsal and anal fins are low, highest anteriorly, with rays 3 to 5 longest; these rays in the anal fin are almost three times as long as the last ray, whereas in the dorsal fin the anterior rays are only about twice as long as the last ray, which is slightly prolonged and falls some distance short of reaching the bases of the procurrent caudal rays. The asymmetrical caudal fin is very weakly forked, less so than in any other American species I have seen except *H. rosae*. As in many halfbeaks, the lower caudal lobe is longer.

The air or swim bladder as noted in the single male is simple, without any cellular structure.

Coloration.—The general coloration was noted in the field by the collector. When taken from the water the body of the new species was intense blue and green varying in brilliance according to the reflection of light from the surface, the blue and green grading into each other. The fins or the belly are believed to have been yellow or orange. No bright color was seen anywhere on the beak. This observation is important, for most, if not all, of the American halfbeaks have the fleshy tip of the mandible red. According to Herre (1944, p. 9) the Philippine species of *Hemiramphus* (including *Hyporhamphus*) have this tip red, green, or greenish white, depending upon the species. I therefore interpret the lack of red color on this structure in *patris* as a character of specific value.

The color of the preserved specimens (in alcohol) is mostly light silvery to pale brownish. The back, above the lateral band on each side, is marked with brownish punctulations, which are usually more concentrated on the posterior borders of the scales. Along the middle of the back are three narrow longitudinal rows of dark pigment, broader near the occiput and particularly over the caudal peduncle; the outer rows are more or less continuous past the base of the dorsal but the middle row is disrupted in this region into a series of U- or V-shaped markings between the bases of the rays. The base of the anal fin is marked similarly to that of the dorsal base, but the longitudinal rows of pigment are far less conspicuous. On each side of the body is a dark band, probably silvery in life, which is very narrow anteriorly and broadest between dorsal and anal fins. The upper surface of the anterior part of the head, including the upper jaw, and of the mandible is black; the lower surface of the mandible is finely

pigmented with black chromatophores fading posteriorly so that both chin and throat are largely colorless. The tips of the caudal rays and those of the longer dorsal rays are marked with fine black punctulations; the other fins are mostly pale. Along the underside of the caudal peduncle are three rather irregular longitudinal rows of dark pigment. The silvery peritoneum is overlain by coppery brown and by fine, black punctulations.

Habitat and associates.—Río del Fuerte, near El Fuerte, Sinaloa, is a deep river with sand and mud bottom and abrupt rocky banks. On May 4, 1942, when the types were collected, the current was fairly swift, and hauls with a 25-foot bag seine were made in water generally 1 to 5 feet deep but more than 6 feet in places. At noon the air was 37° C. and the water 32° C. No vegetation was seen, and the shore was sandy, with trees along the bank. Collecting was confined largely to the backwaters. The point where the fish were secured is fully 100 miles upstream from the Pacific.

In the large collection made here, the following fishes, tentatively identified, were also seined: A species of cyprinid fish of the genus *Gila;* two specimens of a catfish of the genus *Ictalurus;* cyprinodont fishes of several genera including *Mollienisia sphenops;* six mullets, *Agonostomus monticola;* a large number of the fresh-water atherine *Melaniris crystallinus;* and two gobies, *Awaous* (or *Chonophorus*) *transandeanus* and *Gobiomorus maculatus.* Most of these species are confined to fresh water.

Range.—The new species was collected only in the Río del Fuerte. Ralph G. Miller saw halfbeaks in the Río Culiacán at Culiacán, Sinaloa, Mexico, about 150 miles south of El Fuerte and about 40 miles upstream from the Pacific, but the identity of this species is unknown.

Relationships.—Hyporhamphus patris appears to be the southern representative of *H. rosae* (Jordan and Gilbert) (1880), which is known from San Pedro, Calif., south to the tip of Baja California, then up the west side of the Gulf of California and southward along the mainland of Mexico to Guaymas, Sonora (Evermann and Jenkins, 1891, p. 135; record confirmed by examination of the five specimens from Guaymas in the Stanford Natural History Museum, No. 437). Río del Fuerte, the habitat of *patris*, is about 170 miles south of Guaymas.

The two species agree in most measurements and counts and in the following important characters: (1) Posterior position of the pelvic fins; (2) gill rakers: 21 to 25 on the lower limb of the first gill arch in my counts for *rosae*, 21 to 24 for *patris;* (3) long mandible, which appears to be slightly longer in *rosae*, but a series of comparable sizes would probably eliminate this difference; (4) no scales on the dorsal or anal fins; (5) dentition. The two species differ as shown in the comparison presented in table 2. Some or all of these differences

may vanish when larger series of both species from more localities are available, but it seems best at this time to regard them as distinct species.

TABLE 2.—*Comparison of* Hyporhamphus patris *and* H. rosae

Character	*rosae*	*patris*
Color of mandible	Dark red	Black.
Fleshy tip of mandible	Red	Not red.
Scales in lateral series	58–65	54–59.
Bony interorbital into length of head.	3.4–3.8	3.8–4.1.
Diameter of orbit into head length.	3.4–4.0	4.0–4.3.
Size	Smaller; largest specimen 107 mm. in standard length, usually much less than 100 mm. long.	Larger; largest specimen 130 mm. long and smallest 107 mm.

The posterior position of the pelvic fins and the few gill rakers readily separate *patris* from *Hyporhamphus unifasciatus* (Ranzani), *H. roberti* (Valenciennes) (=*hildebrandi* Jordan and Evermann), *H. snyderi* Meek and Hildebrand, and *H. gilli* Meek and Hildebrand, the other species reported from Middle America (Meek and Hildebrand, 1923, pp. 236–241, pls. 16–17).

Acknowledgments.—Material of *Hyporhamphus rosae* was borrowed from the Stanford Natural History Museum, through the kindness of Miss Margaret Storey, and from the Chicago Natural History Museum, through the courtesy of K. P. Schmidt and Mrs. Marion Grey. I am grateful for this cooperation.

LITERATURE CITED

CUVIER, GEORGES L. C. F. D.

1817. Le règne animal distribué d'après son organisation, pour servir de base à l'anatomie comparée, vol. 2, xviii + 532 pp., illus. Paris.

EVERMANN, BARTON WARREN, and JENKINS, OLIVER PEEBLES.

1891. Report upon a collection of fishes made at Guaymas, Sonora, Mexico, with descriptions of new species. Proc. U. S. Nat. Mus., vol. 14, pp. 121–165, 2 pls.

GILL, THEODORE NICHOLAS.

1859. Description of *Hyporhamphus*, a new genus of fishes allied to *Hemirhamphus* Cuv. Proc. Acad. Nat. Sci. Philadelphia, 1859, p. 131.

1863. Note on the genera of Hemirhamphinae. Proc. Acad. Nat. Sci. Philadelphia, 1863, pp. 272–273.

HERRE, ALBERT W. C. T.

1944. A review of the halfbeaks or Hemiramphidae of the Philippines and adjacent waters. Stanford Univ. Publ., univ. ser., biol. sci., vol. 9, No. 2, pp. 39–86, 1 map.

HUBBS, CARL LEAVITT, and MILLER, ROBERT RUSH.

1941. *Dorosoma smithi*, the first known gizzard shad from the Pacific drainage of Middle America. Copeia, 1941, No. 4, pp. 232–238, 1 fig.

JORDAN, DAVID STARR, and GILBERT, CHARLES HENRY.

1880. Description of a new species of *Hemirhamphus* (*Hemirhamphus rosae*), from the coast of California. Proc. U. S. Nat. Mus., vol. 3, pp. 335–336.

MEEK, SETH EUGENE, and GOSS, DAVID KOPP.

1885. A review of the American species of the genus *Hemirhamphus*. Proc. Acad. Nat. Sci. Philadelphia, 1884, pp. 221–226.

MEEK, SETH EUGENE, and HILDEBRAND, SAMUEL FREDERICK.

1923. The marine fishes of Panama: Part 1. Publ. Field Mus. Nat. Hist. No. 215, zool. ser., vol. 15, xi + 330 pp., 24 pls.

POEY, FELIPE.

1860. Memorias sobre la historia de la isla de Cuba, vol. 2, fasc. 2, pp. 97–336.

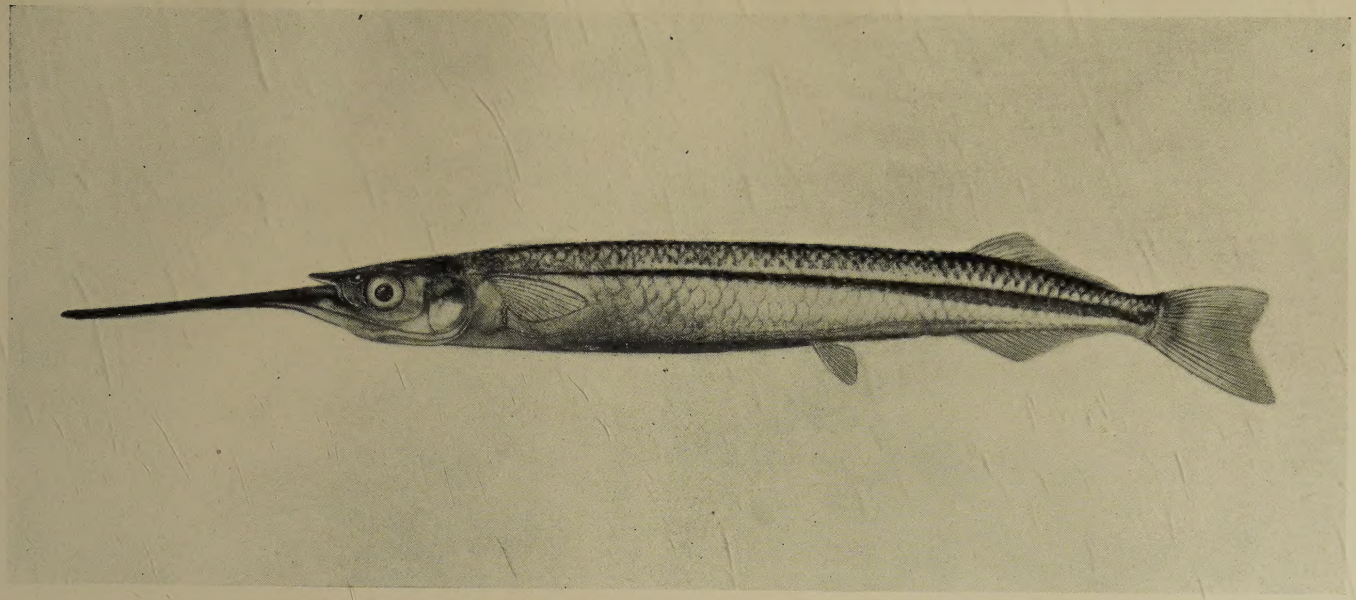
SMITH, J. L. B.

1933. The South African species of the genus *Hemirhamphus* Cuv. Trans. Roy. Soc. South Africa, vol. 21, pt. 2, pp. 129–150, 1 fig., 3 pls.

WEED, ALFRED CLEVELAND.

1933. Notes on fishes of the family Hemirhamphidae. Publ. Field Mus. Nat. Hist., zool. ser., vol. 22, pp. 41–66.

U. S. GOVERNMENT PRINTING OFFICE: 1945



HYPORHAMPHUS PATRIS, NEW SPECIES.

Holotype specimen (U.S.N.M. No. 129956), 118 mm. in standard length. Photograph retouched by Mrs. A. M. Awl.